White Sands Complex (WSC)
TCP/IP Data Interface Service Capability (WDISC)
Project Review

Friday, July 24, 1998

Building 12 GSFC, Room N112, 9:00 A.M.

WDISC Project Review Agenda

Project Overview	**Reine Chimiak**
Requirements Baseline / Operational Concept and Scenarios	**Frank Weinstein**
Redundancy Capability	**Andre Fortin**
Testing	**Tom Russell**
Summary	**Reine Chimiak**
PTP Demonstration	**Mary Ellen Orsini**

Project Overview

- Introduction
- Objective
- Concept Architecture
- Approach
- Schedule and Interdependencies
- Status

Introduction

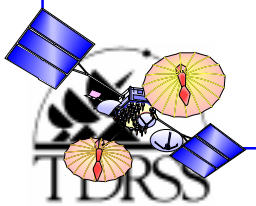
- NISN is in process of replacing the current 4800-bit-block point to point serial network with an IP based system
- Some future low data rate, limited support SN customers have been requesting TCP/IP supported data services
  - New Millennium Program Earth Orbiter-1 (NMP/EO-1)
  - Far Ultraviolet Spectroscopy Explorer (FUSE), and Gravity Probe B Relativity (GP-B)

The WDISC is being implemented to serve customers who require TCP/IP access to the WSC for telemetry and command processing via the closed IONET

Objective

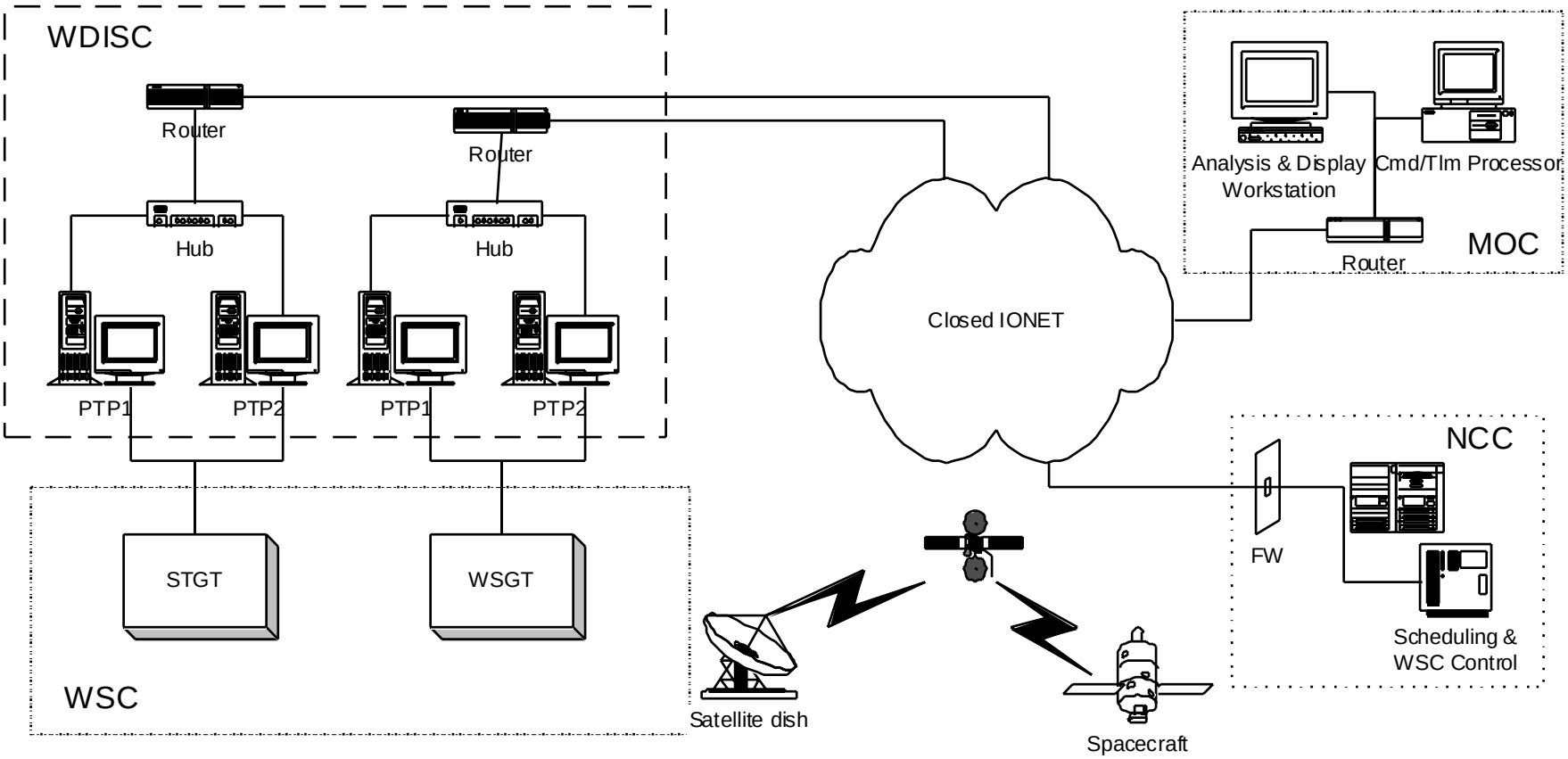
The overall objective of the WDISC effort is to provide direct TCP/IP based telemetry and command services on the closed IONET from the WSC

- **Specific strategies in support of this objective include:**
  - **Support testing and operational phases of the EO-1 and GP-B missions.**
  - **Ensure that the design allows for, to the extent possible, future expansion and enhancement.**
  - **Provide data services without requiring the need for mission unique equipment at WSC.**
  - **Incorporate and evolve SN support of CCSDS standards and services.**



WDISC Project Review

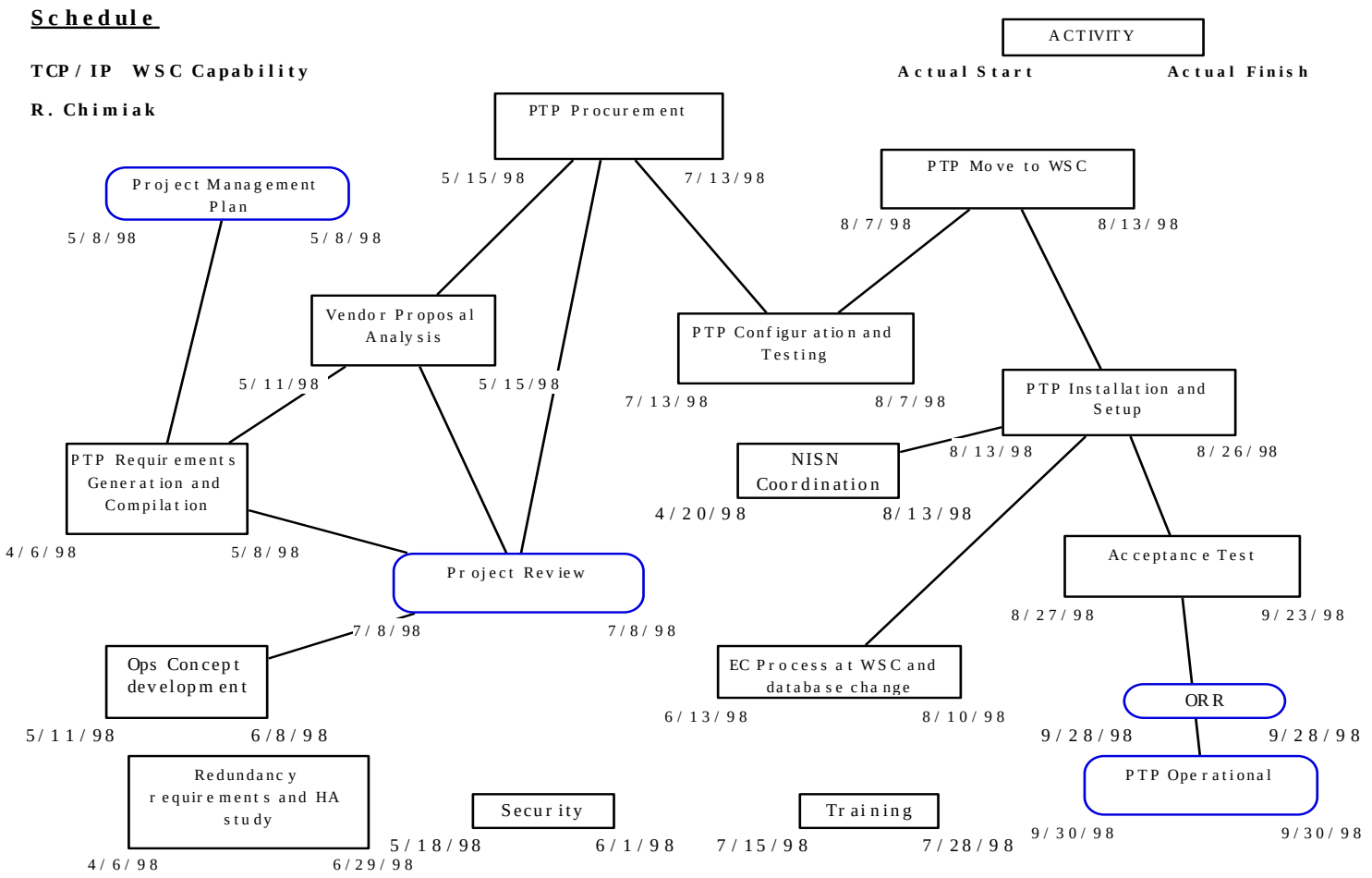
Concept Architecture



Approach

- Project Planning and Requirement Compilation
- Vendor Proposal Analysis
- Programmable Telemetry Processors (PTP) Procurement Process
- WDISC Project Review and Operations Concept Development
- PTP Configuration and Testing at GSFC
- Equipment Shipping and Installation at WSC
- Acceptance Testing and Transition to Operations

Schedule and Interdependencies



Status of Documentation

Document	*Status*
WDISC Project Management Plan	*Complete
WDISC System Requirements	*Complete
WDISC Operations Concept	*Complete
WDISC Service Specification	*Complete
WDISC Security Evaluation	Complete
Startup Procedures (Installation Instructions, Configuration Files)	August 98
Test Procedures	August 98
User's Guide	September 98

**Available on line at URL: http://nmsp.gsfc.nasa.gov/WDISC*

Note on Configuration Management (CM): Code 451, SN CCB will be used for CM of the WDISC requirements. All other documentation shall be controlled by the WDISC Team Lead.

Status of Developmental Activities

Activity	*Status*
Timer Server/ Scheduler GUI	**unit tested**
Build PTP Configurations	**August 98**
Redundancy	**partially tested**

Requirements Baseline/Operations Concept and Scenarios

- WDISC Configuration
- Scheduling
- Real-Time Processing
- Data Playback
- WDISC Capacities

Configuration

- WDISC is located at WSC
  - Prime and backup at WSGT and at STGT
- Three primary interfaces:
  - Forward and return service data connections with WSC via LI ports — "hardwired"
  - Forward and return service data TCP/IP connections with customer via Closed IONET
  - Operational control TCP/IP connection with NCC via Closed IONET

Scheduling

- For each customer, a set of PTP "desktops" must be developed
  - PTP desktop specifies the configuration of a PTP telemetry board, including
    - Processing specification for each PTP module
    - Relationships of the modules
- Customer scheduling process is via the NCCDS, and is the same as for any SN customer
- Once per day, the NCC Scheduler will:
  - Read SN schedule from NCCDS
  - Filter to find events supported by WDISC
  - Enter daily WDISC schedule and upload to PTP Timer software within WDISC

Scheduling GUI

Real-Time Data Flows

- At scheduled service start time, PTP Timer software initiates PTP desktop
- Customer establishes TCP/IP connection
- Return service data flows from ground terminal LI port through WDISC and through IONET to customer IP address
- Forward service data flows from customer through IONET to WDISC IP address and through WDISC to ground terminal LI port

TCP/IP Connections

Service	User Interface Channel	Domain Name XXX.ops.nascom.nasa.gov	Port
Forward-1	W30	XXX=scptp1 *or* scptp2	10000
Return-1	W55	XXX=scptp1 *or* scptp2	10000
Control-1	–	XXX=scptp1 *or* scptp2	11000
Forward-2	W31	XXX=scptp1 *or* scptp2	10001
Return-2	W56	XXX=scptp1 *or* scptp2	10001
Control-2	–	XXX=scptp1 *or* scptp2	11001
Forward-3	W32	XXX=scptp1 *or* scptp2	10002
Return-3	W57	XXX=scptp1 *or* scptp2	10002
Control-3	–	XXX=scptp1 *or* scptp2	11002
Forward-4	W40	XXX=wcptp1 *or* wcptp2	10000
Return-4	W69	XXX=wcptp1 *or* wcptp2	10000
Control-4	–	XXX=wcptp1 *or* wcptp2	11000
Forward-5	W41	XXX=wcptp1 *or* wcptp2	10001
Return-5	W79	XXX=wcptp1 *or* wcptp2	10001
Control-5	–	XXX=wcptp1 *or* wcptp2	11001
Forward-6	W42	XXX=wcptp1 *or* wcptp2	10002
Return-6	W80	XXX=wcptp1 *or* wcptp2	10002
Control-6	–	XXX=wcptp1 *or* wcptp2	11002

Real-Time Monitoring and Fault Isolation

- NCC Operator (PA or TM)
  - Works with CCTV display and dedicated keyboard and mouse at OCR console
  - Runs COTS PTP client software on a Windows NT machine
  - Logs on an active PTP at WSC
  - Uses PTP GUI to display status
  - If failure is detected, can use GUI to restart PTP server software or reset PTP desktop
- WSC operators also have capability to monitor and restore PTP services (as backup to NCC)

Data Playback

- If specified by desktop, WDISC will record return service data.
- A return service data log file will be created at service start time and closed at service stop time.
- At any time after file is closed, customer can access return service data log file via FTP.

WDISC Capacities

- Three forward/return service data channel pairs at WSGT
- Three forward/return service data channel pairs at STGT
- Return service data rate up to one Mbps
- Forward service data rate up to one Mbps

Redundancy Capability

- Overview
- Forward Service
  - Configuration
  - Operations
- Implementation

Redundancy -- Overview

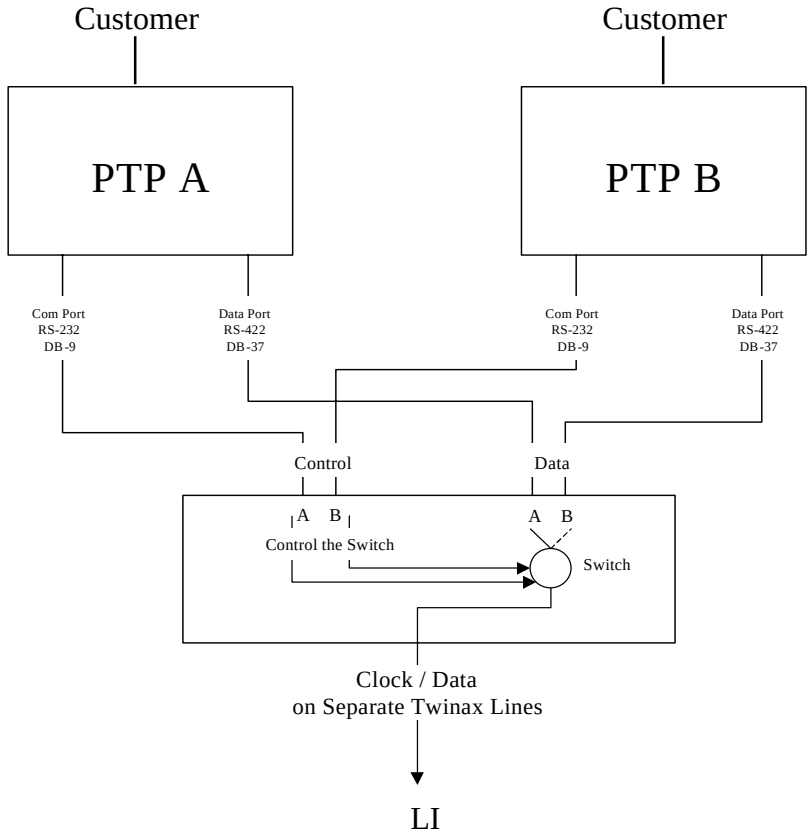
- Basic Principles
  - MOC has responsibility for recognizing failure condition and carrying out failover procedure
  - NCC Operator monitors status, as needed, and assists in fault isolation and restoration of full service capability
- Return Service Configuration
  - When NCCDS schedules a return LI port, this also allocates a PTP board in both the prime and backup WDISC
    - Customer can connect to either or both
    - Absence of data prior to scheduled service stop time (or expected LOS) would be primary indication of possible WDISC failure

Redundancy -- Overview (continued)

- **Forward Service Configuration**
  - **When NCCDS schedules a forward LI port, this also allocates a PTP board in both the prime and backup WDISC**
    - **Provide customer-controlled switches for forward service**
    - **Customer can connect to either PTP board or both, but can configure only one to flow forward service data**
  - **Customer has two socket connections, data and control/status**
    - **For control, customer sends ASCII string to switch**
    - **For status, customer can listen for "heartbeat" (optional)**
  - **Loss of "heartbeat" status prior to scheduled service stop time would be primary indication of possible WDISC failure**

Redundancy -- Overview (continued)

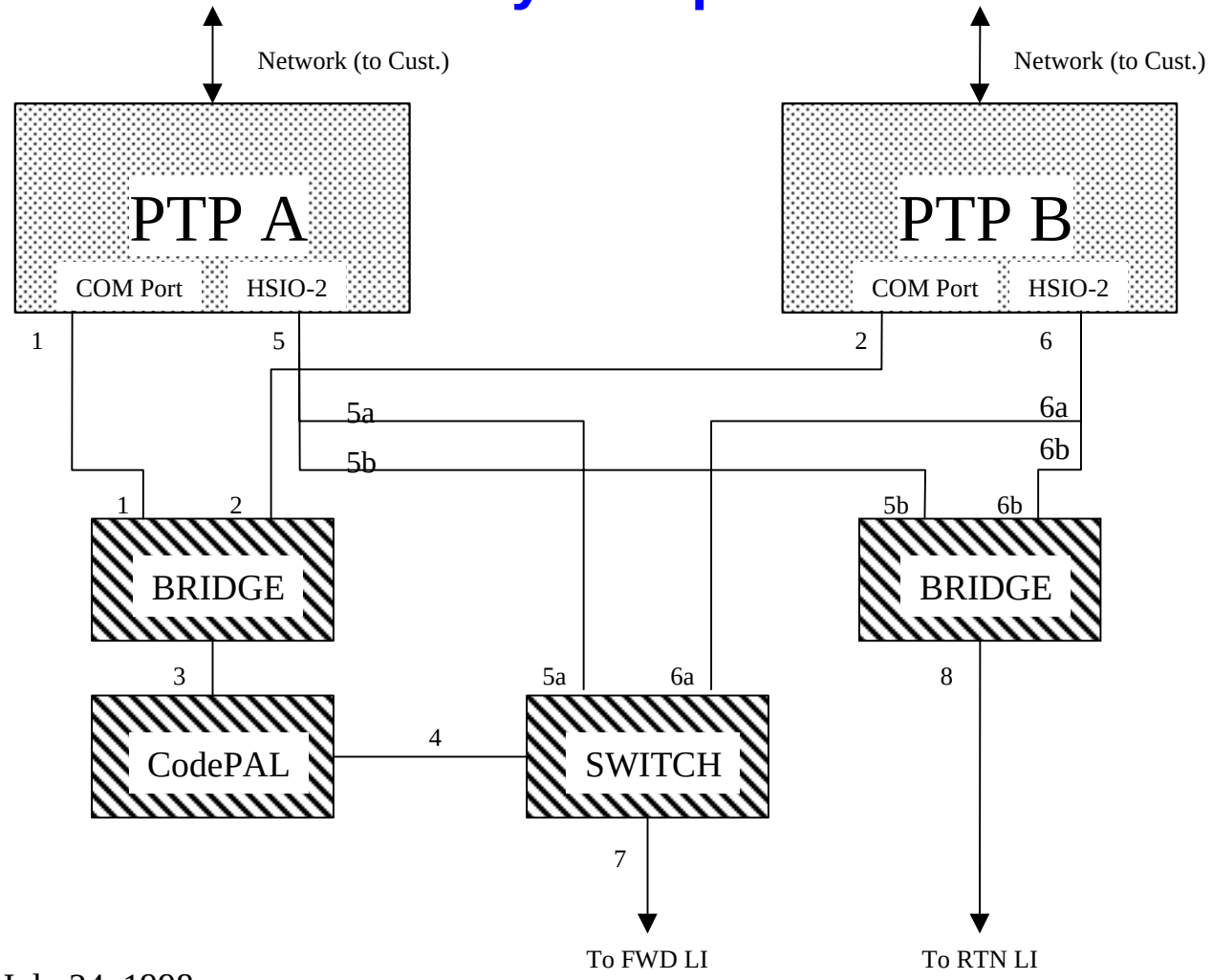
- **Forward Service Configuration (continued)**
  - **Each "desktop" will have "relay" modules to pass onto the controllers the commands to switch**
  - **Totally COTS, but not perfect: single point of failure for switch (MTBF 150KHrs), controller (MTBF 105KHrs), bridge (MTBF XXXKHrs)**



Redundancy -- Forward Service Operations

- At event start
  - Customer connects to data port and control/status port of PTP
  - Customer sends unique character string to switch forward link
- During event
  - Customer pauses for length of time necessary for idle pattern
  - Customer sends command data, monitors “heartbeat”
- If failure:
  - Customer disconnects data and control/status ports
  - Connects to backup PTP, reconfigures forward data switch, and tries again

Redundancy -- Implementation



WDISC Acceptance Testing Agenda

- Network Integration and Analysis (NIA) Role
- Test Approach
- Training
- Test Deliverables and Schedules
- Operations Transition Tasks

NIA Role

- Plan and Conduct Acceptance Testing as well as Customer Interface Testing
- Analyze System Operability
- Support Transition to Operations

Test Approach

- Integration and System Testing by Engineering Personnel
- NCC Operations Evaluation Test Phase
  - Operator Interface Test
  - Functional Test
  - Performance Test
  - Operator Training
- Network Confidence Phase
  - NCC PTP Configuration Testing
  - Data Flows
    - Conducted Utilizing Both Ground Stations
    - Forward/Return and Playback

Test Approach (continued)

- End-to-End
  - Conducted Utilizing Both Ground Stations at the WSC
  - Involve Simulated MOC Forward/Return and Playback Testing
    - Include NCC/MOC Interface
    - Customer MOC Participation TBD
  - Load Testing
    - Simultaneous Support for an Extended Period of Time
    - Failover Capability

Training

- Test Personnel - NIA
  - TCP/IP Courses (Self-paced)
  - PTP Classes (NTTF)
  - WDISC Equipment Demonstration
- Operations Personnel - NCC/WSC
  - TCP/IP Courses (Self-paced)
  - PTP Classes (NTTF)
  - Operations Evaluation Testing and Test Support

Test Deliverables and Schedule

- Test Plan
  - Draft by 8/12 and Final by 8/26
  - Test Requirements Mapping
- Briefing Messages
  - Issued 3 Business Days Prior to Test Start
- Conduct Testing Between 8/27 through 9/23
  - 10 Business Days Notice Required for Each Network Test
- NIA Will Generate a Test Results Report within 24 hrs. after Test
- Tracking Trouble Reports (TTRs)

Operations Transition Tasks

- Examine Operational Proficiency Metrics and Negotiate as Needed
- Assess Staffing
- Certification Requirements or Updates for Operations Personnel
- Operations Procedures
  - LOPs/OIPs/SOPs/SNUG
- Maintenance Plan

Issues

- PTP architecture requires that forward and return service LI ports be scheduled in pairs.
- Manual scheduling interface with NCCDS should be satisfactory for initial customers.
- No real-time service reconfiguration capability.
- Potential impact on Closed IONET bandwidth.
- Open IONET PTP Services

Summary

A version of the review is available from the WDISC Web page at URL:

http://nmsp.gsfc.nasa.gov/WDISC

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